

900°C, 1000°C & 1200°C Single Zone Tube Furnaces



MTF 10/25/130/301
MTF 12/38/250/301

CTF 12/65/550/301
MTF 12/38/400/301

General Features

- Eleven standard size wire-wound tube furnaces.
- Maximum operating temperatures of 900°C, 1000°C & 1200°C.
- Rapid heat-up to operating temperature.
- Select from multiple work tube diameters ranging from 5/8" (15 mm) to 4" (100 mm).
- Seven heated length choices from 5" (130 mm) to 36" (900 mm) provide for multiple working and uniformity requirements.
- Integral ceramic work tube with external element winding creates furnace chamber.
- Integral work tube is convenient and suitable for processing in air.
- Easily slide a separate tube through work tube for processing under atmosphere.
- Furnace incorporates low thermal mass ceramic fiber insulation for improved response times.
- Furnaces are normally mounted horizontally on a support base or cabinet.
- Thermocouple is located in a protection tube between the chamber work tube and heating element.
- All wire-wound tube furnaces can be provided for optional vertical operation. (See page 43)
- Safety outer mesh guard provides low temperature external surface.
- Furnace controls are built into the supporting base or cabinet, providing convenient observation and access to all power and temperature controls.
- Choice of Model 301 control or programmers.
- Choice of multiple accessories and options, including process tubes, gas tight end seals, insulating plugs, radiation shields, etc. (See pages 42-45)

900°C, 1000°C & 1200°C Single Zone Wire-Wound Tube Furnaces

Furnace Model	Max. Temp. (°C)	Work Tube Inside Dia. Inches (mm)	Heated Length Inches (mm)	Overall Furnace Length Inches (mm)	TC Type	Max. Power (kW)	Furnace Voltage	External Dimensions Inches (mm)			Shipping Weight (lb.)
								Height	Length	Depth	
MTF 9/15/130	900	0.6 (15)	5.00 (130)	7.00 (180)	K	.25	120	7.00 (180)	7.00 (180)	3.50 (90)	14
MTF 10/15/130	1000	0.6 (15)	5.00 (130)	6.00 (150)	K	.40	120	10.50 (265)	6.00 (150)	6.75 (175)	22
♦ MTF 10/25/130	1000	1.00 (25)	5.00 (130)	6.00 (150)	K	.40	120	10.50 (265)	6.00 (150)	6.75 (175)	22
MTF 12/25/250	1200	1.00 (25)	10.00 (250)	12.00 (300)	N	.70	120	14.75 (375)	14.50 (370)	14.75 (375)	38
♦ MTF 12/38/250	1200	1.50 (38)	10.00 (250)	12.00 (300)	N	1.0	120	14.75 (375)	17.75 (450)	14.75 (375)	38
MTF 12/25/400	1200	1.00 (25)	15.75 (400)	17.75 (450)	N	1.0	120	17.00 (430)	14.50 (370)	14.75 (375)	44
♦ MTF 12/38/400	1200	1.50 (38)	15.75 (400)	17.75 (450)	N	1.5	120	17.00 (430)	17.75 (450)	14.75 (375)	44
MTF 12/38/850	1200	1.50 (38)	33.50 (850)	35.50 (900)	N	2.8	208/240	17.00 (430)	35.50 (900)	14.75 (375)	104
♦ CTF 12/65/550	1200	2.50 (65)	21.50 (550)	24.50 (625)	N	2.0	208/240	20.75 (525)	24.50 (625)	14.25 (360)	80
CTF 12/75/700	1200	3.00 (75)	27.50 (700)	30.50 (775)	N	3.0	208/240	20.75 (525)	30.50 (775)	14.25 (360)	84
CTF 12/100/900	1200	4.00 (100)	35.50 (900)	38.50 (975)	N	4.5	208/240	20.75 (525)	38.50 (975)	14.25 (360)	104

♦ Stock Products

Note: Stock furnaces are provided with 301 control.
Continuous operating temperature is 100°C below maximum temperature.

Specify voltage at time of order.
Furnaces operate on single phase voltage.



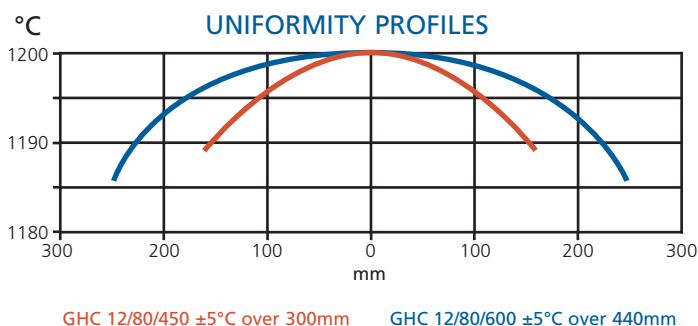
1200°C Large Bore Tube Furnaces



GHA 12/75/600/301

General Features

- Maximum operating temperature of 1200°C.
- Designed to accept process tubes up to 6.5" OD.
- Six different heated lengths of 18", 24", 30", 36", 42" & 48" provide for multiple working and uniformity requirements.
- Insulating end vestibules improve chamber uniformity and incorporate interchangeable tube adapters.
- These tube adapters allow convenient conversion to different diameter process tubes.
- Long-life free radiating heating element design provides excellent radial and linear chamber uniformity.
- High efficiency low mass vacuum formed ceramic fiber insulation enhances heat-up rates.
- Carbolite large bore tube furnaces are available in single and three zone designs.
- Three zone tube furnaces provide a longer uniform temperature zone through elevation of end zone temperatures to compensate for normal end losses.
- Safety outer mesh guard provides low temperature external surface.
- Furnaces are normally mounted horizontally on an attractive support base.
- Furnace controls are built into the support base, providing convenient observation and access to all power and temperature controls.
- Each tube furnace is available for optional vertical operation.
- Vertical design is interconnected to a separate control cabinet with a 6 foot cable. (See page 42)
- Each three zone furnace incorporates three separate temperature controls to allow variation of setpoint temperature in each zone.
- GHC model end zone controllers may be slaved to the center zone or fully independent. (See page 44)
- Choice of 301 or programmable controls.
- See furnace options on pages 42-45.



1200°C Large Bore Tube Furnaces

Furnace Model	Max. Temp. (°C)	Maximum OD Tube • Inches (mm)	Heated Length Inches (mm)	Number of Zones	TC Type	Max. Power (kW)	Furnace Voltage	External Dimensions Inches (mm)			Shipping Weight (lb.)
								Height	Length	Depth	
GHA 12/450	1200	6.50 (170)	17.75 (450)	1	N	3.1	208/240	26.50 (670)	26.75 (676)	18.50 (468)	130
GHA 12/600	1200	6.50 (170)	23.50 (600)	1	N	3.9	208/240	26.50 (670)	32.50 (826)	18.50 (468)	146
GHA 12/750	1200	6.50 (170)	29.50 (750)	1	N	4.7	208/240	26.50 (670)	38.50 (976)	18.50 (468)	179
GHA 12/900	1200	6.50 (170)	35.50 (900)	1	N	5.5	208/240	26.50 (670)	44.50 (1126)	18.50 (468)	203
GHA 12/1050	1200	6.50 (170)	41.25 (1050)	1	N	6.2	208/240	26.50 (670)	50.25 (1276)	18.50 (468)	238
GHA 12/1200	1200	6.50 (170)	47.25 (1200)	1	N	7.0	208/240	26.50 (670)	56.25 (1426)	18.50 (468)	265
GHC 12/450	1200	6.50 (170)	17.75 (450)	3	N	3.1	208/240	26.50 (670)	26.75 (676)	18.50 (468)	130
GHC 12/600	1200	6.50 (170)	23.50 (600)	3	N	3.9	208/240	26.50 (670)	32.50 (826)	18.50 (468)	146
GHC 12/750	1200	6.50 (170)	29.50 (750)	3	N	4.7	208/240	26.50 (670)	38.50 (976)	18.50 (468)	179
GHC 12/900	1200	6.50 (170)	35.50 (900)	3	N	5.5	208/240	26.50 (670)	44.50 (1126)	18.50 (468)	203
GHC 12/1050	1200	6.50 (170)	41.25 (1050)	3	N	6.2	208/240	26.50 (670)	50.25 (1276)	18.50 (468)	238
GHC 12/1200	1200	6.50 (170)	47.25 (1200)	3	N	7.0	208/240	26.50 (670)	56.25 (1426)	18.50 (468)	265

• Specify tube OD at time of order.

Specify voltage at time of order.

Furnaces operate on single phase voltage.

Continuous operating temperature is 100°C below maximum temperature.



General Features

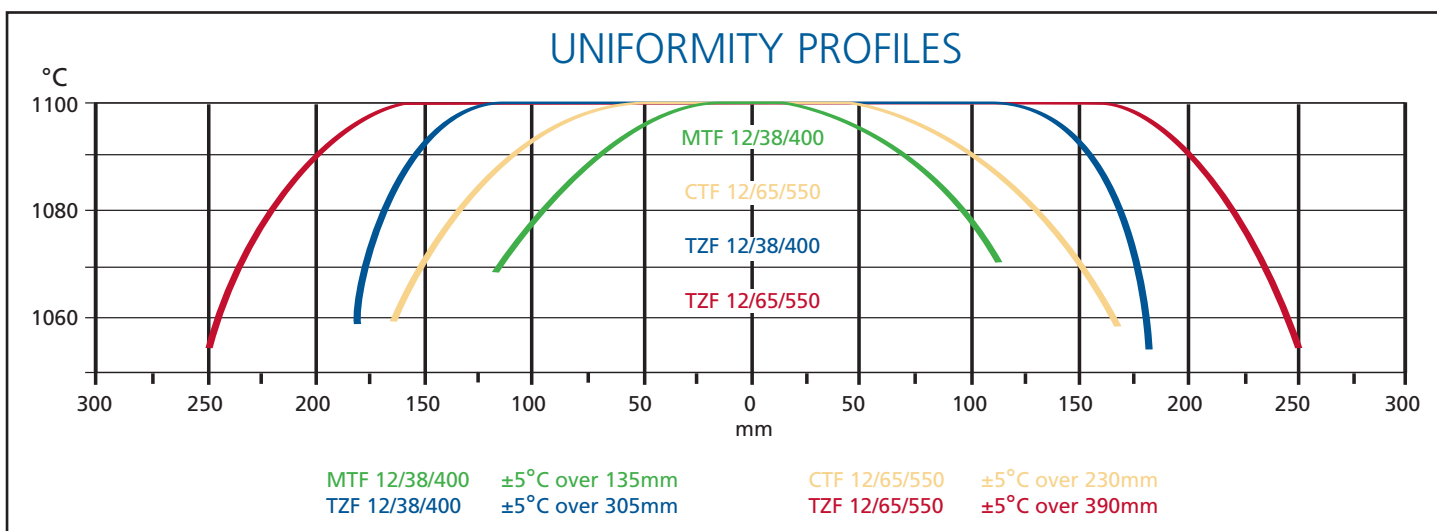
- Design features listed for single zone wire-wound tube furnaces (page 29) also apply to TZF three zone tube furnaces.
- Five standard size three zone wire-wound tube furnaces to choose from.
- Three zone design provides enhanced linear temperature uniformity.
- Maximum operating temperature of 1200°C.
- Three temperature control instruments allow variation of setpoint temperature in each furnace zone. (See page 44)
- End zone controllers may be slaved to center zone or fully independent.
- Select from multiple work tube diameters ranging from 1.5" (38 mm) to 4" (100 mm).
- Five heated length choices from 15.75" (400 mm) to 36" (900 mm).



TZF 12/75/700/3216P1

Each TZF model is derived from a MTF or CTF tube furnace having two additional independently controlled heating zones. TZF three zone tube furnaces are ideal for applications which demand a uniform temperature over an extended length. The end zones are normally wired to maintain an adjustable temperature differential

from the center zone. This design has the advantage that if a programmable control is installed in the center zone, the end zones will follow the same program. Alternatively, when programming is not required, fully independent control of the end zones is available if specified when ordering. See page 44.



1200°C Three Zone Wire-Wound Tube Furnaces											
Furnace Model	Max. Temp. (°C)	Work Tube Inside Dia. Inches (mm)	Heated Length Inches (mm)	Overall Length Inches (mm)	TC Type	Max. Power (kW)	Furnace Voltage	Height	External Dimensions Inches (mm)	Shipping Weight (lb.)	
TZF 12/38/400	1200	1.50 (38)	15.75 (400)	17.75 (450)	N	1.5	120/208/240	17.00 (430)	17.75 (450)	14.75 (375)	71
TZF 12/38/850	1200	1.50 (38)	33.50 (850)	35.50 (900)	N	2.8	208/240	17.00 (430)	35.50 (900)	14.75 (375)	110
TZF 12/65/550	1200	2.50 (65)	21.50 (550)	23.50 (600)	N	2.0	208/240	20.75 (525)	24.50 (625)	14.25 (360)	84
TZF 12/75/700	1200	3.00 (75)	27.50 (700)	29.50 (750)	N	3.0	208/240	20.75 (525)	30.50 (775)	14.25 (360)	102
TZF 12/100/900	1200	4.00 (100)	35.50 (900)	37.50 (950)	N	4.5	208/240	20.75 (525)	38.50 (975)	14.25 (360)	106

Specify voltage at time of order.
Continuous operating temperature is 100°C below maximum temperature.

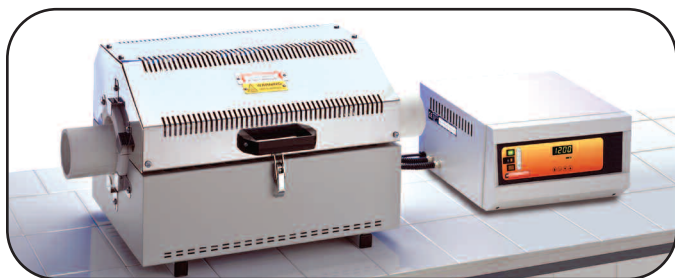
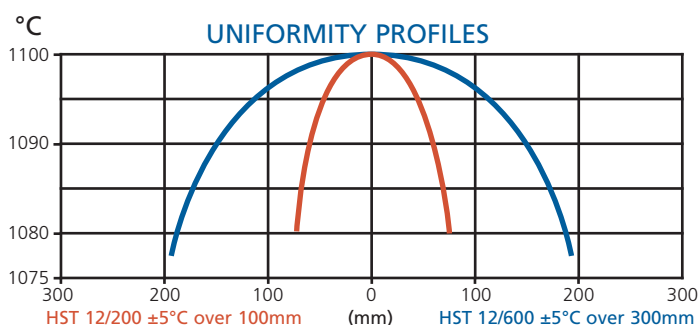
Furnaces operate on single phase voltage.



1200°C Horizontal Split-Hinge Tube Furnaces



HST 12/70/600



HST 12/86/400/301

(Tube not included)

General Features

- Maximum operating temperature of 1200°C.
- Available in multiple heated lengths of 8", 12", 16", 24" and 36".
- Split-hinge design allows for convenient process observation, enhanced cooling, and easy fixturing of the process tube.
- Designed to accept process tubes up to 4" OD (100 mm).
- Insulating end vestibules improve chamber uniformity and incorporate interchangeable tube adapters.
- These tube adapters allow easy conversion to different diameter process tubes.
- Carbolite split-hinge tube furnaces are available in single and three zone designs.
- Three zone tube furnaces provide a longer uniform temperature zone through elevation of end zone temperatures to compensate for normal end losses.
- Carbolite HZS and TVS three zone tube furnaces are zoned 6-12-6 and 6-24-6.
- Long-life free radiating heating element design provides excellent radial and linear chamber uniformity.
- High efficiency low mass vacuum formed ceramic fiber insulation enhances heat-up and recovery rates.
- Each three zone furnace incorporates three separate temperature controls to allow variation of setpoint temperature in each zone.
- HZS model end zone controllers may be slaved to the center zone or fully independent. (See page 44)
- Positive break furnace safety switch isolates power to the heating elements when furnace is opened.
- Low outer case temperature provided through double shell construction.
- Carbolite hinged tube furnaces are designed for bench mounting, and are interconnected to a separate control cabinet with a 6 foot cable.
- Choice of 301 or programmable controls.
- See furnace options on pages 42-45.

1200°C Horizontal Split-Hinge Tube Furnaces

Furnace Model	Max. Temp. (°C)	Maximum O.D. Tube • Inches (mm)	Heated Length Inches (mm)	No. of Zones	External Dimensions Inches (mm)			TC Type	Max. Power (kW)	Furnace Voltage	Shipping Weight (lb.)
					Height	Length	Depth				
HST 12/200	1200	4.00 (110)	8.00 (200)	1	13.75 (350)	12.75 (325)	16.25 (410)	N	1.0	120	75
HST 12/300	1200	4.00 (110)	12.00 (300)	1	13.75 (350)	16.75 (425)	16.25 (410)	N	1.5	120	82
HST 12/400	1200	4.00 (110)	15.75 (400)	1	13.75 (350)	20.50 (525)	16.25 (410)	N	2.0	208/240	88
HST 12/600	1200	4.00 (110)	23.75 (600)	1	13.75 (350)	28.50 (725)	16.25 (410)	N	3.0	208/240	102
HST 12/900	1200	4.00 (110)	35.50 (900)	1	13.75 (350)	40.25 (1025)	16.25 (410)	N	4.5	208/240	153
HZS 12/600	1200	4.00 (110)	23.75 (600)	3	13.75 (350)	28.50 (725)	16.25 (410)	N	3.0	208/240	115
HZS 12/900	1200	4.00 (110)	35.50 (900)	3	13.75 (350)	41.25 (1050)	16.25 (410)	N	4.5	208/240	161

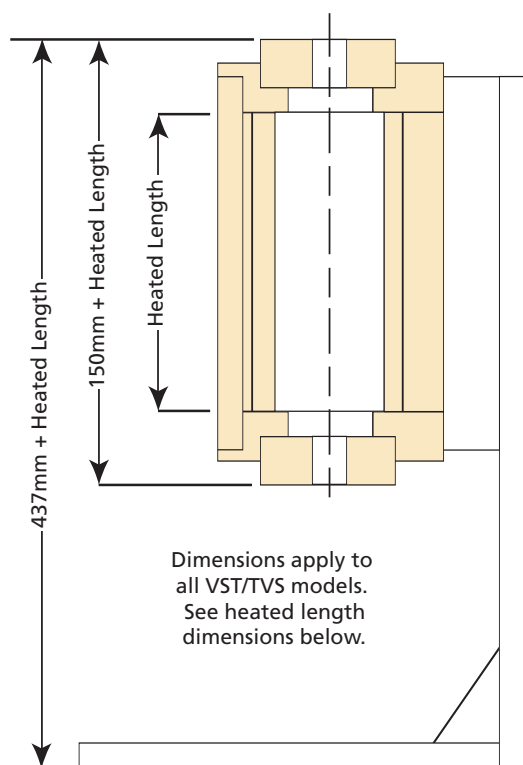
• Specify tube OD at time of order.
Continuous operating temperature is 100°C below maximum temperature.

Specify voltage at time of order.
Furnaces operate on single phase voltage.



General Features

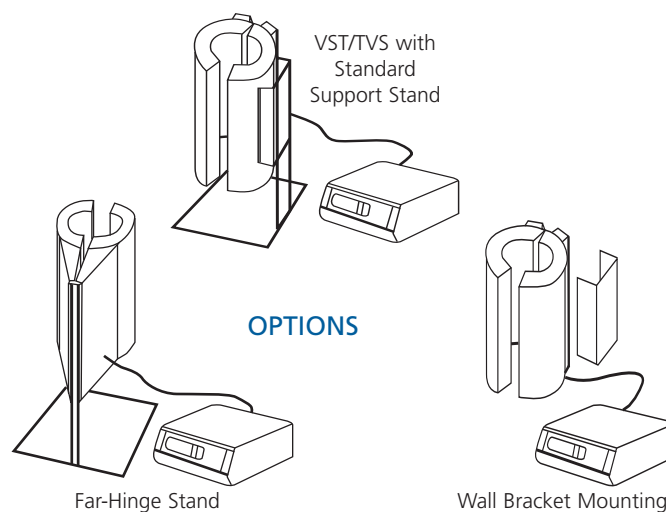
- General design features listed for horizontal split-hinge tube furnaces (page 32) also apply to vertical split-hinge tube furnaces.
- Standard vertical hinged tube furnaces are provided with a vertical support stand.
- Optional far hinge vertical support stand or wall bracket are available. (see illustrations below)



VST/TVS Tube Furnace on Standard Support Stand



TVS 12/600/3508P1



1200°C Vertical Split-Hinge Tube Furnaces

Furnace Model	Max. Temp. (°C)	Maximum O.D. Tube • Inches (mm)	Heated Length Inches (mm)	Overall Furnace Length Inches (mm)	Number of Zones	TC Type	Max. Power (kW)	Furnace Voltage	Shipping Weight (lb.)
VST 12/200	1200	4.00 (100)	8.00 (200)	13.75 (350)	1	N	1.0	120	71
VST 12/300	1200	4.00 (100)	12.0 (300)	17.75 (450)	1	N	1.5	120	73
VST 12/400	1200	4.00 (100)	15.75 (400)	21.50 (550)	1	N	2.0	208/240	75
VST 12/600	1200	4.00 (100)	23.75 (600)	29.50 (750)	1	N	3.0	208/240	91
VST 12/900	1200	4.00 (100)	35.50 (900)	41.25 (1050)	1	N	4.5	208/240	200
TVS 12/600	1200	4.00 (100)	23.75 (600)	29.50 (750)	3	N	3.0	208/240	91
TVS 12/900	1200	4.00 (100)	35.50 (900)	41.25 (1050)	3	N	4.5	208/240	200

• Specify tube OD at time of order.
Continuous operating temperature is 100°C below maximum temperature.

Specify voltage at time of order.

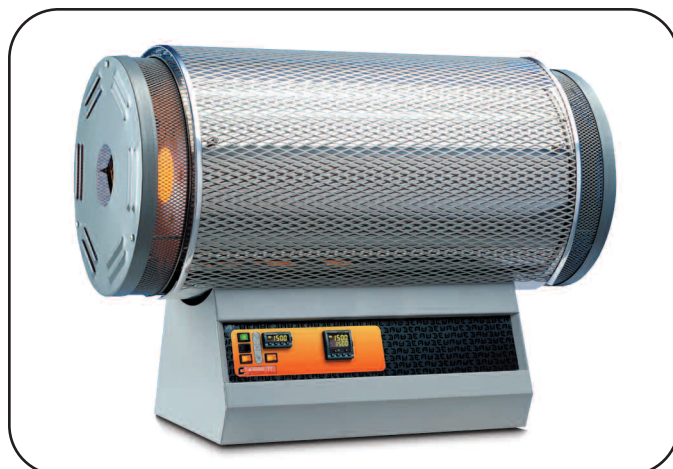
Furnaces operate on single phase voltage.



1500°C & 1600°C Tube Furnaces

General Features

- Maximum operating temperatures of 1500°C or 1600°C.
- Available in heated lengths of 18" and 24" single zone.
- The 24" heated length is also available in a 3 zone design.
- Three zone tube furnaces provide a longer uniform temperature zone through elevation of end zone temperatures to compensate for normal end losses.
- Mini design offered with 7" heated length, for use with process tubes up to 2.25" OD.
- Furnaces incorporate low thermal mass ceramic fiber insulation for improved heat-up rates and energy efficiency.
- Long-life free radiating silicon carbide heating elements provide excellent radial and linear chamber uniformity.
- Power may be easily increased to heating elements from the temperature controller to compensate for SiC element resistance change (aging). This feature assures that the furnace's original heat-up characteristics and maximum rated temperature is always achieved.
- Furnaces are normally mounted horizontally on a support base or cabinet.
- Furnace controls are built into the support base, providing convenient observation and access to all power and temperature controls.
- Insulating end vestibules improve chamber uniformity.
- Safety outer mesh guard provides low temperature external surface.
- All 1500° & 1600°C tube furnaces can be provided for optional vertical operation. (See page 43)
- Vertical design is interconnected to a separate control cabinet with 6 ft. cable.
- Three zone furnaces incorporate three separate temperature controls to allow variation of setpoint temperature in each zone.
- TZF model end zone controllers may be slaved to the center zone or fully independent. (see page 44)
- Choice of 301 or programmable controls.
- See furnace options on pages 42-45.



STF 15/450/3216P1/OTC



STF 15/610/3216P1
with Vertical Option "L" Stand

1500°C & 1600°C Single and Three Zone Tube Furnaces

Furnace Model	Max. Temp. (°C)	Maximum O.D. Tube • Inches (mm)	Heated Length Inches (mm)	No. of Zones	TC Type	Max. Power (kW)	Furnace Voltage	External Dimensions			Shipping Weight (lb.)
								Height	Inches (mm) Length	Depth	
STF 15/180	1500	2.25 (60)	7.00 (180)	1	R	1.5	208/240	19.75 (500)	23.75 (600)	14.75 (375)	85
STF 15/450	1500	3.50 (90)	17.75 (450)	1	R	5.5	208/240	26.00 (660)	32.75 (830)	17.50 (445)	100
STF 15/610	1500	3.50 (90)	24.00 (610)	1	R	6.0	208/240	26.00 (660)	44.50 (1130)	17.50 (445)	133
STF 16/180	1600	2.25 (60)	7.00 (180)	1	R	2.5	208/240	19.75 (500)	23.75 (600)	14.75 (375)	95
STF 16/450	1600	3.50 (90)	17.75 (450)	1	R	6.0	208/240	26.00 (660)	32.75 (830)	17.50 (445)	110
STF 16/610	1600	3.50 (90)	24.00 (610)	1	R	7.0	208/240	26.00 (660)	44.50 (1130)	17.50 (445)	139
TZF 15/610	1500	4.25 (110)	24.00 (610)	3	R	8.0	208/240*	26.00 (660)	44.50 (1130)	17.50 (445)	133
TZF 16/610	1600	4.25 (110)	24.00 (610)	3	R	9.0	208/240*	26.00 (660)	44.50 (1130)	17.50 (445)	139

• Specify tube OD at time of order.

Specify voltage at time of order.

* 3 phase electrical design.

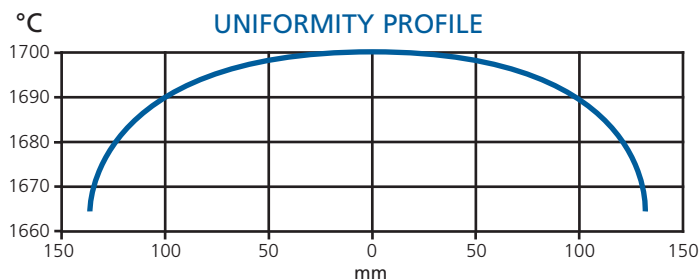
Continuous operating temperature is 100°C below maximum temperature.



CTF 17/75/300/3216P1

General Features

- Maximum operating temperatures of 1700°C and 1800°C.
- Use with process tubes up to 3.5" OD.
- Available in heated lengths of 12" and 24" single zone.
- The 24" heated length is also available in a 3 zone design.
- Three zone tube furnaces provide a longer uniform temperature zone through elevation of end zone temperatures to compensate for normal end losses.
- All Carbolite 1700°C and 1800°C tube furnaces are fitted with a 3216P1 programmable temperature control and a separate independent over-temperature protection control.
- Long-life free radiating molybdenum disilicide heating elements provide excellent radial and linear uniformity.
- Advanced high temperature graded insulation assembly provides improved energy efficiency and heat-up rates.
- Furnace controls are built into the furnace cabinetry, providing convenient observation and access to all power and temperature controls.
- Low outer case temperature provided through double shell construction.
- Mesh tube guards at ends of furnace prevent accidental contact with hot tube.
- Insulating end vestibules improve chamber uniformity.
- Molybdenum disilicide element resistance does not change with usage, providing no restriction on placement of a new element in circuit with older elements.
- Three zone furnaces incorporate three separate temperature controls to allow variation of setpoint temperature in each zone.
- Serviceability is aided by the furnace's mechanical and electrical design.
- See furnace options on pages 42-45.



CTF 17/75/300 ±5°C over 205mm
±2°C over 150mm
±1°C over 75mm

1700° & 1800° Horizontal Single and Three Zone Tube Furnaces

Furnace Model	Max. Temp. (°C)	Maximum O.D. Tube • Inches (mm)	Heated Length Inches (mm)	No of Zones	TC Type	Max. Power	Furnace Voltage (kW)	External Dimensions Inches (mm)			Shipping Weight (lb.)
								Height	Length	Depth	
CTF 17/300	1700	3.50 (90)	12.00 (300)	1	B	4.2	208/240	29.75 (755)	23.50 (600)	21.75 (555)	454
CTF 17/600	1700	3.50 (90)	23.75 (600)	1	B	6.9	208/240	35.50 (900)	37.50 (950)	25.00 (630)	565
CTF 18/300	1800	3.50 (90)	12.00 (300)	1	Pt 20% Rh/Pt 40% Rh	5.2	208/240	29.75 (755)	23.50 (600)	21.75 (555)	454
CTF 18/600	1800	3.50 (90)	23.75 (600)	1	Pt 20% Rh/Pt 40% Rh	5.7	208/240	29.75 (755)	35.50 (900)	21.75 (555)	565
TZF 17/600	1700	4.25 (110)	23.75 (600)	3	B	9.0	208/240*	35.50 (900)	37.50 (950)	25.00 (630)	732
TZF 18/600**	1800	4.25 (110)	23.75 (600)	3	Pt 20% Rh/Pt 40% Rh	10.0	208/240*	37.25 (943)	40.25 (1020)	25.00 (630)	732

• Specify tube OD at time of order.

Specify voltage at time of order.

*3 Phase electrical design.

** Retransmission of setpoint provided as standard. (See page 44)

Continuous operation at or near maximum temperature may impact element, thermocouple and insulation life.



1700°C & 1800°C Vertical Tube Furnaces



VST 17/75/250



PVT 18/75/350/3508P1

General Features

- Maximum operating temperature of 1700°C.
- Split-hinge design provided with vertical support stand.
- Overall heated length of 10".
- Designed to accept process tubes up to 3.5" OD (90 mm).
- Six long-life molybdenum disilicide heating elements are suspended vertically around the tube to ensure excellent radial and linear uniformity.
- Carbolite VST hinged tube furnace is designed for bench mounting, and is interconnected to a separate control cabinet with 6 ft. cable.
- Provided with 3216P1 programmable temperature control and a separate independent over-temperature protection control.
- Advanced high temperature graded insulation assembly provides improved energy efficiency and heat-up rates.
- Low outer case temperature provided through double shell construction.
- Insulating end vestibules reduce heat losses and improve chamber uniformity.
- Positive break furnace safety switch isolates power to the heating elements when furnace is opened.

General Features

- Maximum operating temperature of 1800°C.
- Available in heated lengths of 8" and 13.75".
- Each PVT furnace is designed to accept a different diameter process tube. Models available for 2", 3", 4" & 5" diameter tubes.
- Long-life free radiating lanthanum chromite heating elements are suspended vertically around the tube, providing excellent radial and linear uniformity.
- Carbolite PVT tube furnaces are provided with a floor standing vertical support stand, and are interconnected to a separate control cabinet with 6 ft. cable.
- Provided with 3216P1 programmable temperature control and a separate independent over-temperature protection control.
- Advanced high temperature graded insulation assembly provides improved energy efficiency.
- Insulating end vestibules reduce heat losses and improve chamber uniformity.
- Low outer case temperature provided through double shell construction.
- Lanthanum chromite heating elements give off a small amount of chromium vapor, which the work tube shields all but the most sensitive work pieces from contamination or pink coloration.

1700°C & 1800°C Vertical Tube Furnaces

Furnace Model	Max. Temp. (°C)	Maximum OD Tube • Inches (mm)	Heated Length Inches (mm)	TC Type	Max. Power (kW)	Furnace Voltage	External Dimensions Inches (mm)			Shipping Weight (lb.)
							Height	Length	Depth	
VST 17/250	1700	3.50 (90)	10.00 (250)	B	4.5	208/240	34.00 (865)	23.75 (600)	27.75 (705)	665
PVT 18/50/200	1800	2.25 (57)	8.00 (200)	Pt 20% Rh/Pt 40% Rh	5.5	208/240	See Below	27.50 (700)	32.00 (810)	420
PVT 18/75/350	1800	3.50 (90)	13.75 (350)	Pt 20% Rh/Pt 40% Rh	9.0	208/240 *	See Below	27.50 (700)	32.00 (810)	660
PVT 18/100/350	1800	4.25 (108)	13.75 (350)	Pt 20% Rh/Pt 40% Rh	6.0	208/240 *	See Below	27.50 (700)	32.00 (810)	660
PVT 18/125/350	1800	5.25 (133)	13.75 (350)	Pt 20% Rh/Pt 40% Rh	9.3	208/240 *	See Below	27.50 (700)	32.00 (810)	660

• Specify tube OD at time of order.

Specify voltage at time of order.

* 3 Phase electrical design.

Customer must specify desired PVT furnace height when ordering. (Contact Carbolite)

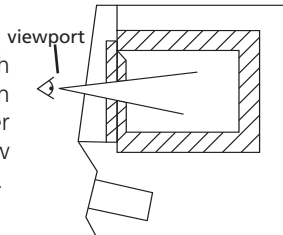
Continuous operation at or near maximum temperature may impact element, thermocouple and insulation life.

Box Furnace Options

Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all box furnace options.

Access and/or Viewing Port

A 1" diameter hole is placed through the furnace door. Optionally select an open hole with a stainless steel cover disc that pivots, or a quartz window that is permanently fitted in the hole.



Additional Thermocouple

An additional thermocouple, similar to the control thermocouple, is built into the furnace and connected to a thermocouple socket. This TC socket is mounted in the furnace control panel. Typically used by the customer for connection to a recorder or other temperature measurement device.

Thermocouple Calibration Port

An additional thermocouple ceramic sheath is installed adjacent to the control thermocouple and accessed through the back of the furnace. Allows insertion of a customer's reference thermocouple for checking or calibration of the existing controller/thermocouple system.

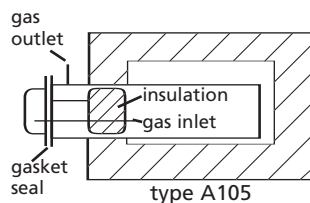
Inert Gas Inlet

A 6 mm hose connection on the rear of furnace is connected to a ceramic tube that extends into the chamber. This option is suitable only for inert gases or oxygen.

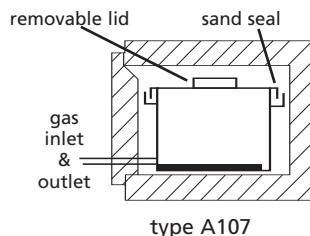
NOTE: Carbolite box furnaces are not gas tight. Gas introduction may affect the furnace heating characteristics and/or the performance of some heating elements. (Contact Carbolite with questions.)

Atmosphere Retorts (1100°C)

Gas tight inonel enclosures designed specifically to fit in standard Carbolite box furnaces. Type A105 style retort is designed with easily removable insulated front plug door. Gas inlet and outlet pipes are accessible near front of retort. The normal furnace door mechanism is retained for use when the retort is removed.



Type A107 style retorts are similar to a pack carburizing box using a sand seal between the deep base and shallow removable lid. Gas inlet and outlet pipes extend from the front of the retort through slots in the furnace door.

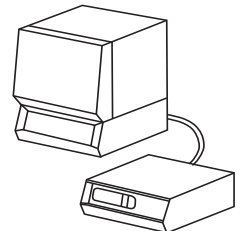


Thermocouple Gland

A thermocouple gland may be installed in the A105 or A107 retort, and gas tight end seals for process tubes. A 1.5mm or 3mm gland is available to seal a mineral insulated probe thermocouple, or a 10 mm gland to seal a ceramic sheath. See page 44 for information on thermocouple probes.

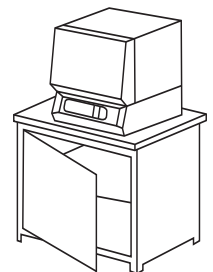
Separate Controls

A separate control cabinet incorporates all temperature control and power control components normally installed in the box furnace cabinetry. A blank panel replaces the control panel in the furnace base.



Furnace Support Cabinet

A furnace support cabinet with a single internal shelf is available in three sizes to accommodate various box and tube furnace models. Cabinet incorporates a heat resisting stainless steel top surface.



Tube Furnace Options

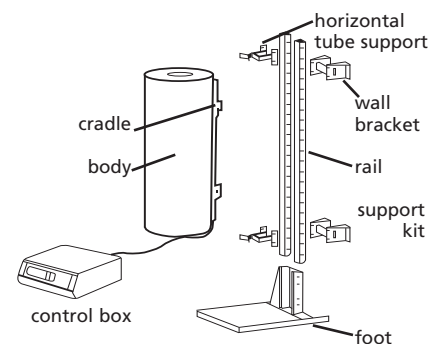
Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all tube furnace options.

Process Tubes

Carbolite offers multiple diameters and lengths of process tubes suitable for use with Carbolite or other manufacturer tube furnaces. Mullite, high purity alumina, quartz and alloy tubes are available.

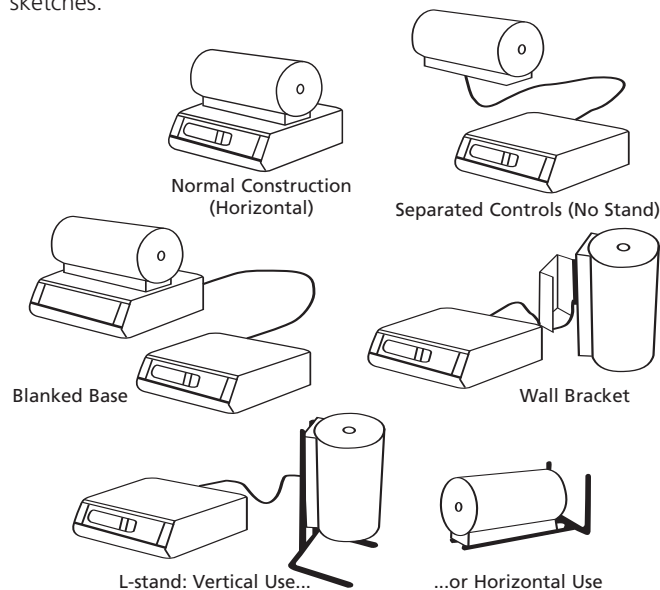
Mounting Options

Large bore "G" style tube furnaces are normally provided for horizontal operation as shown in the photo on page 30. Alternatively, these tube furnaces can be provided for vertical operation. See adjacent sketch.



G range - versatile
No Stand: control box with body & cradle only
No Foot: everything except the foot

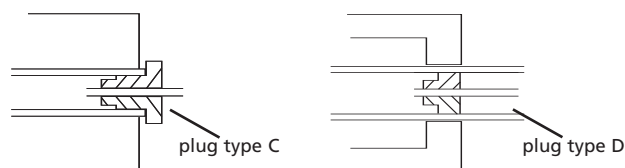
Non-split tube furnaces such as the MTF, CTF and STF, and the matching TZF models are supplied as standard for horizontal use. Alternate mounting options are available as depicted in the sketches.



Split-hinge VST & TVS tube furnaces are also available with different mounting options. See page 33.

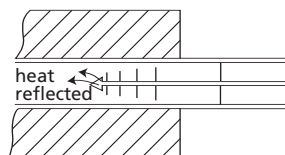
Insulating Plugs

Ceramic fiber insulating plugs installed near the ends of process tubes reduce heat losses and improve uniformity. Type C insulating plugs are designed for applications when processing will be done under air, and are suitable for use with tubes of 1.5" ID and larger. Type D insulating plugs are normally used in conjunction with gas tight end seals when processing is carried out under an atmosphere. Suitable for use with tubes of 2" ID and larger.



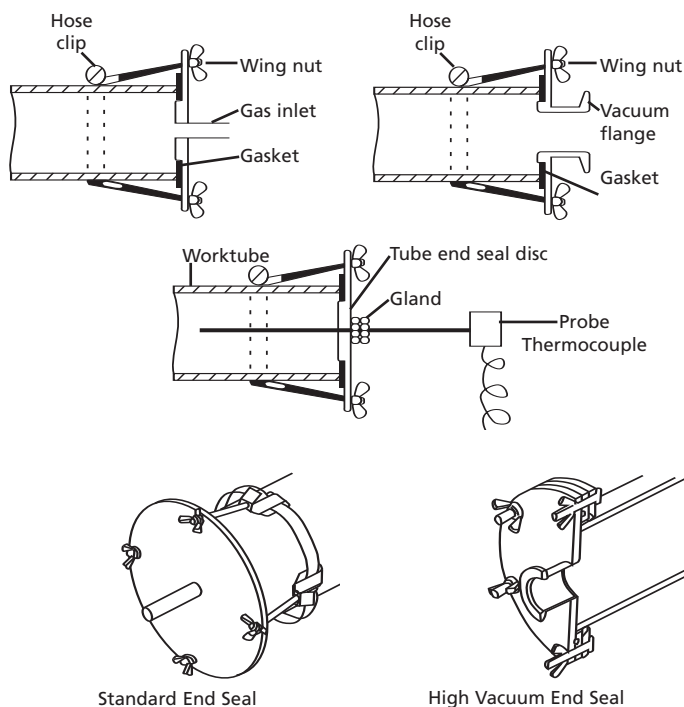
Radiation Shields

Radiation shields are typically used for applications where ceramic fiber plugs are unsuitable, e.g. where a high purity atmosphere or vacuum is required. Normally used in conjunction with gas tight end seals when processing is carried out under atmosphere. Suitable for use with tubes of 2" ID and larger. Radiation shields designed for operating temperatures up to 1200°C are fabricated of inconel, and above 1200°C, are fabricated of alumina.



Gas Tight End Seals

Gas tight end seals provide a convenient method of sealing each end of an open end process tube. Each standard end seal is fitted with a 6 mm hose connection for gas inlet or outlet. Optional vacuum flanges and glands for probe thermocouples can also be installed in the end seals. Gas tight end seals are appropriate for tube diameters of 2" or larger. Standard end seals are suitable for vacuums to 10^{-3} mbar. For higher vacuums to 10^{-5} mbar, a double flange end seal design is available. (Depicted below)



Special Size Tube Furnaces

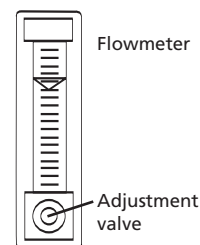
MTF, CTF & TZF wirewound tube furnaces (pages 31 & 32), HST, HZS, VST & TVS split-hinge tube furnaces (pages 32 & 33) and GHA & GHC large bore tube furnaces (page 30) can be provided with special heated and/or zone lengths. Wirewound tube furnaces can also be provided with special diameter work tubes.

Gas Control Options

Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all gas control options.

Gas Flowmeters

Multiple gas flowmeters with a standard scale length of 100 mm (3% accuracy) with needle valve are available for use with gas inlets and retorts. A mounting bracket is included.



Inert Gas Inlet

See description under Box Furnace Options.

Furnace Options

Solenoid Valves

An electric valve used to start and stop a gas flow. May be activated manually by a panel mounted switch, or automatically through a program segment output or temperature alarm relay.

Atmosphere Control System

Recommended when hydrogen gas is required for processing. Provides greater safety and convenience in control of hydrogen and nitrogen purge gas. Protects H₂ introduction at low temperatures, provides a monitored burn-off pilot flame, and senses failure of the gas supplies. Includes H₂ and N₂ flowmeters and is provided in a separate cabinet. Suitable for use with box furnace Type A105 atmosphere retorts or gas tight tubes installed in tube furnaces. Uses a pressure system. For mass flow system, please contact Carbolite.

Temperature Measurement Options

Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all temperature measurement options.

Temperature Indicator

A digital temperature indicator is built into the furnace control panel and wired to a panel mounted thermocouple socket. Intended for use with a probe thermocouple. Also available in a separate stand alone cabinet, so it can be used as a portable temperature checker.

Chart & Data Acquisition Recorders

Carbolite can offer both Chart and Data Acquisition Recorders in single and multiple channel models. Assorted optional features are available with all recorders. The recorder is mounted in the furnace control panel when space permits, or alternatively in a separate cabinet.

Thermocouple Probes

Normally used to monitor temperatures in tube furnaces. Semi-flexible metal sheathed mineral insulated Type K and Type N thermocouples are available in 24" and 39" lengths in 1.5 mm and 3.0 mm diameters. Type R, B and Pt 20% Rh/Pt 40% Rh thermocouples are available in 21", 27" and 33" lengths. Because these thermocouples are very fragile, it is recommended that the thermocouple be combined with an optional 10 mm diameter alumina protection sheath. Each probe thermocouple is fitted with 3' or 6' of compensating leadwire and plug.

Control System Options

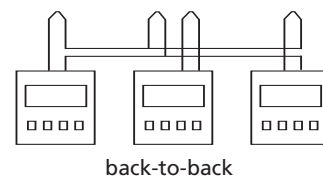
Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all control system options.

Optional Programmers

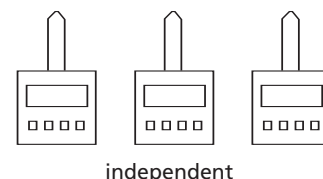
See details on page 4 for additional programmer information.

Three Zone Controls

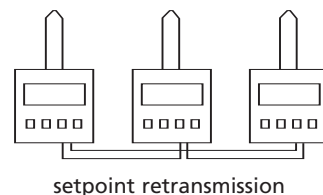
The usual purpose of a three zone furnace and control system is to provide a longer uniform working zone within the furnace. Carbolite's standard three zone control system is a back-to-back thermocouple system with slave end zone controls.



An alternate three zone control system is to provide three totally independent temperature controllers tied directly to individual thermocouples positioned in each zone of the furnace. This is a no charge option.



When controlled programmed cooling is a critical requirement in your program, the Retransmission of Setpoint Option must be ordered. Unfortunately, a disadvantage of a programmable three zone system with slave end zones is its inability to effectively cool at a programmed rate.

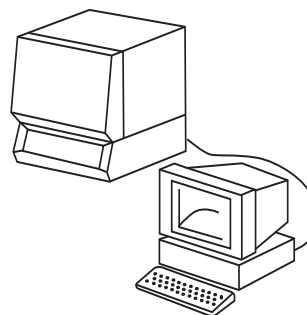


Retransmission of Setpoint

If you require programmed cooling with a three zone tube furnace, the Retransmission of Setpoint Option is required. This option provides control of the end controls setpoint via an analog signal transmitted from the center zone programmable controller. The standard differential thermocouple design is not suitable for programmed cooling.

Digital Communications

Optionally select RS232 or RS485 digital communications. RS232 permits a single controller to communicate with a computer. RS485 permits multiple controllers to communicate with a computer through "daisy chaining" of the instruments. Digital communications is wired to panel mounted sub-miniature "D" socket on rear of furnace.



RS232/485 converter allows connection of furnace control system with RS485 to PC fitted with RS232.

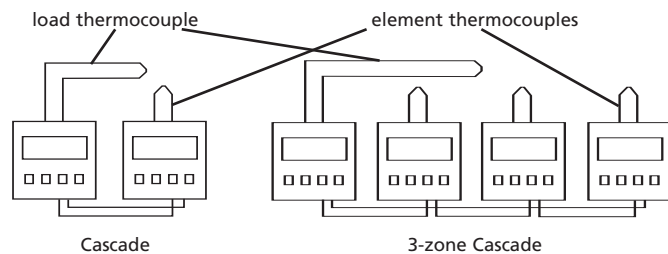
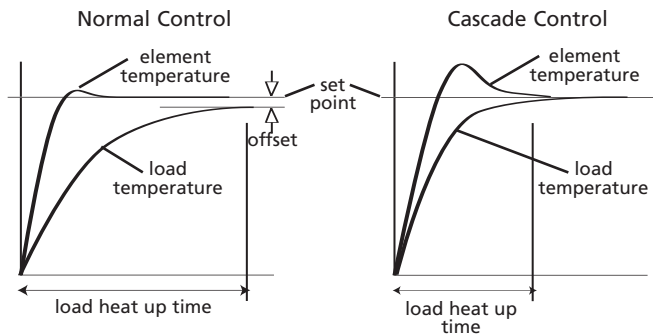
RS232 and RS485 cables are available for connection between furnace and PC, as well as cables to "daisy chain" several furnaces together when operating with a RS485 connection.

ITools and SpecView Software

Carbolite offers ITools and SpecView software that allows instruments to be setup, monitored and recorded from a PC. Contact Carbolite for complete descriptions.

Cascade Control

This control system adds a second thermocouple and controller to the furnace. The additional thermocouple is placed close to the load and connected to the primary controller (load control). The other thermocouple senses the temperature near the heating elements and is connected to the second controller (element control). The Cascade Control System allows you to heat the furnace load at a faster rate and control it more precisely than the conventional one controller one thermocouple temperature control system. Cascade control is only available with the 3508 controller.



Temperature Alarm Relay

Connection from a relay in the controller to a panel mounted jack, providing a volt-free relay output. Available with programmable controllers.

Program Segment Output

As above, but triggered by entering a part or parts of a time/temperature program. Available with 3508P1 programmer.

Audible Alarm

An addition to either of the previous two options. Alarm is cancelled by program skip or setpoint adjustment, or a separate cancellation button. Audible alarm may also be provided with over-temperature protection, with alarm cancellation button.

Analog Communications

DC retransmission of PV or Setpoint output connected to panel jack. Available with programmable controllers.

Over-Temperature Protection

See description on page 4.